

FNAL Status

**International Finance Committee
Hugh Montgomery**

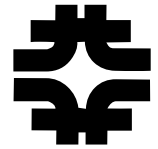
October, 2004

Collider Experiments- April 2004



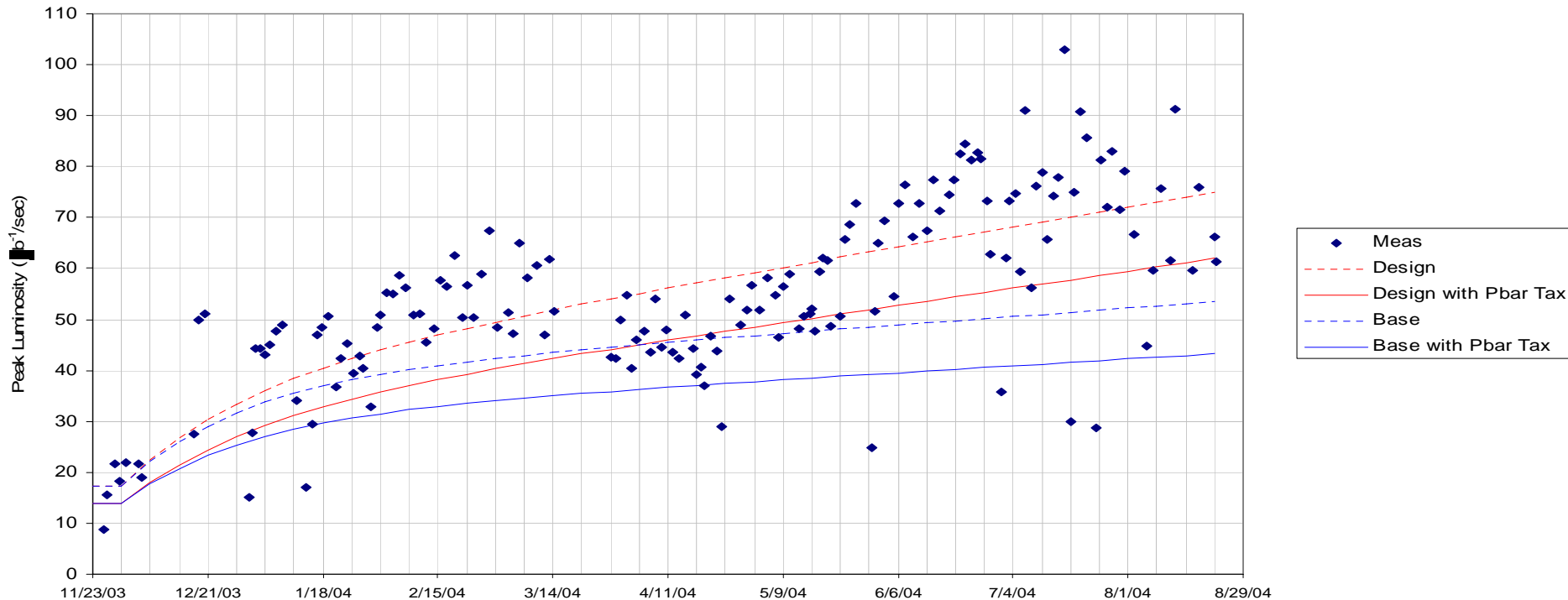
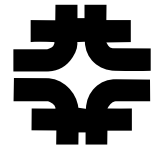
- **Detector Operations**
 - Accelerator Operating conditions are, for a very large fraction of the time, fine for the experiments.
 - Detector Operational Efficiency is as high as was achieved in Run I
- **Offline Processing**
 - Basic Processing is going well
 - External Review of Run II Computing (Bird Committee) in Fall 2003
 - Incorporation of increasing amounts of off-site computing, nascent GRID!
- **Integrated Luminosity**
 - Double from $>200 \text{ pb}^{-1}$ to 4- 500 pb^{-1} during FY04

Collider Experiments: Issues- April 2004

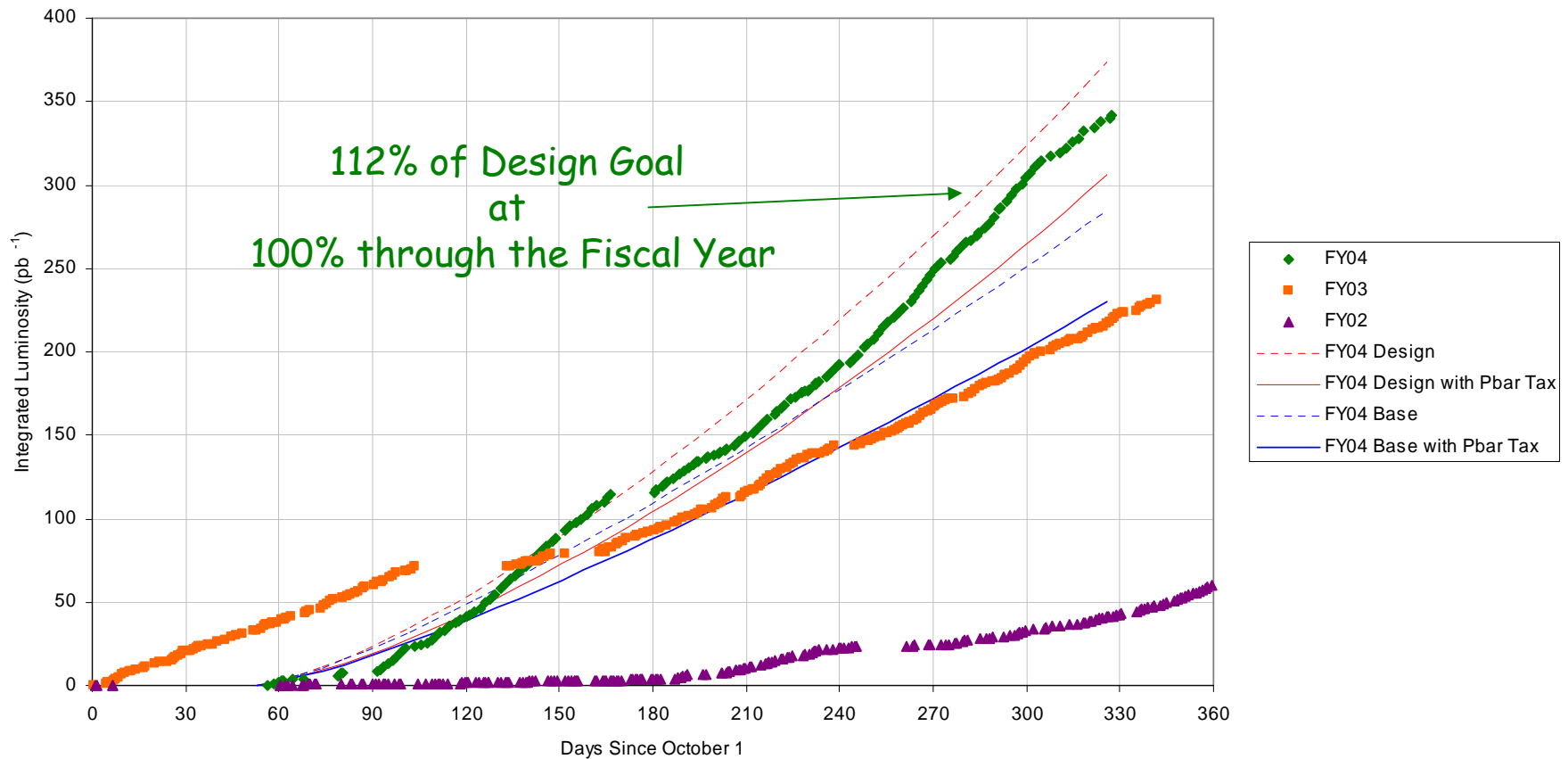
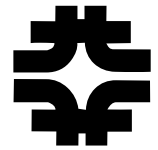


- **CDF**
 - **COT response pattern**
 - Aging, pollution, contamination?
 - Extensive investigations underway
- **D0**
 - **Noise in Muon Triggers, Calorimeter**
 - From muon toroids?
 - Problem disappeared, not understood
 - **Nervousness about silicon channel count**
- **CDF/D0**
 - **Accelerator losses**
 - During operation
 - Response to abnormal
 - Continual program of accelerator improvements
- **Offline Computing**
 - **D0 Reconstruction time, reduced dramatically but number of events increased**
 - **CDF analysis load – lots of physics lots of analyses**

FY04 Peak Luminosity



Integrated Luminosity

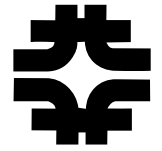


Plans for FY05



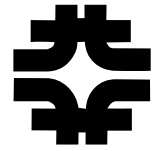
- Install electron cooling in the Recycler in Fall '04 shutdown
- Run Slip Stacking at 8×10^{12} protons/pulse every 2 secs
- Increase the pbar production aperture by 25%
- Stack at small stacks with a rate of 26×10^{10} pbars/hr
- Run the complex in Mixed Pbar operations
 - Assume the gain from Mixed Pbar operations is “break-even” (pessimistic?)
- Commission electron cooling for operations by the end of FY05

Collider Physics



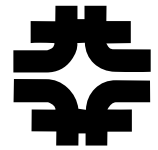
- **From 2004 Self Assessment**
 - **133 Papers submitted by CDF and D0 to the Beijing Conference**
 - **23 Talks in parallel sessions**
 - **3 Plenary Talks**

Run II Computing



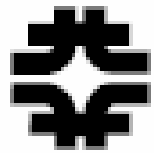
- **Major Infrastructure effort**
 - Conversion of New Muon and Wide Band Counting Room space to computing centers.
 - Wide Band is VERY High Density
 - 100 kVA converted to noise and heat!
- **Run II Computing Review: September 2004**
 - New Chair: Jim Shank B.U.-Atlas
 - Lots of kudos
 - Lots of encouragement in direction of grid

Run IIb Detector Upgrades



- Upgrade Progress has been steady
 - CDF preshower installation in progress
 - D0 Trigger testing with pickoffs
 - D0 checking out inner aperture for L0 silicon
- Director's Reviews in July 2004
 - Cost is under control
 - Tightening of the understanding of the scope and schedule.
- Director's Reviews in Jan/Feb 2005
 - Interplay of detector schedules with accelerator schedule will be watched. (Accel. PMGs)

Major Goals for '04 Shutdown



- **Run II**

Electron Cooling – civil construction and installation of beamline components
Tevatron Alignment – continuing improvements
Separators – add/move for helix improvement

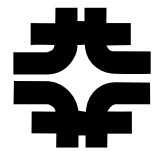
- **NuMI**

Kicker – installation
Instrumentation – installation
Magnets – final hookup and polarity tests
Vacuum – final hookups

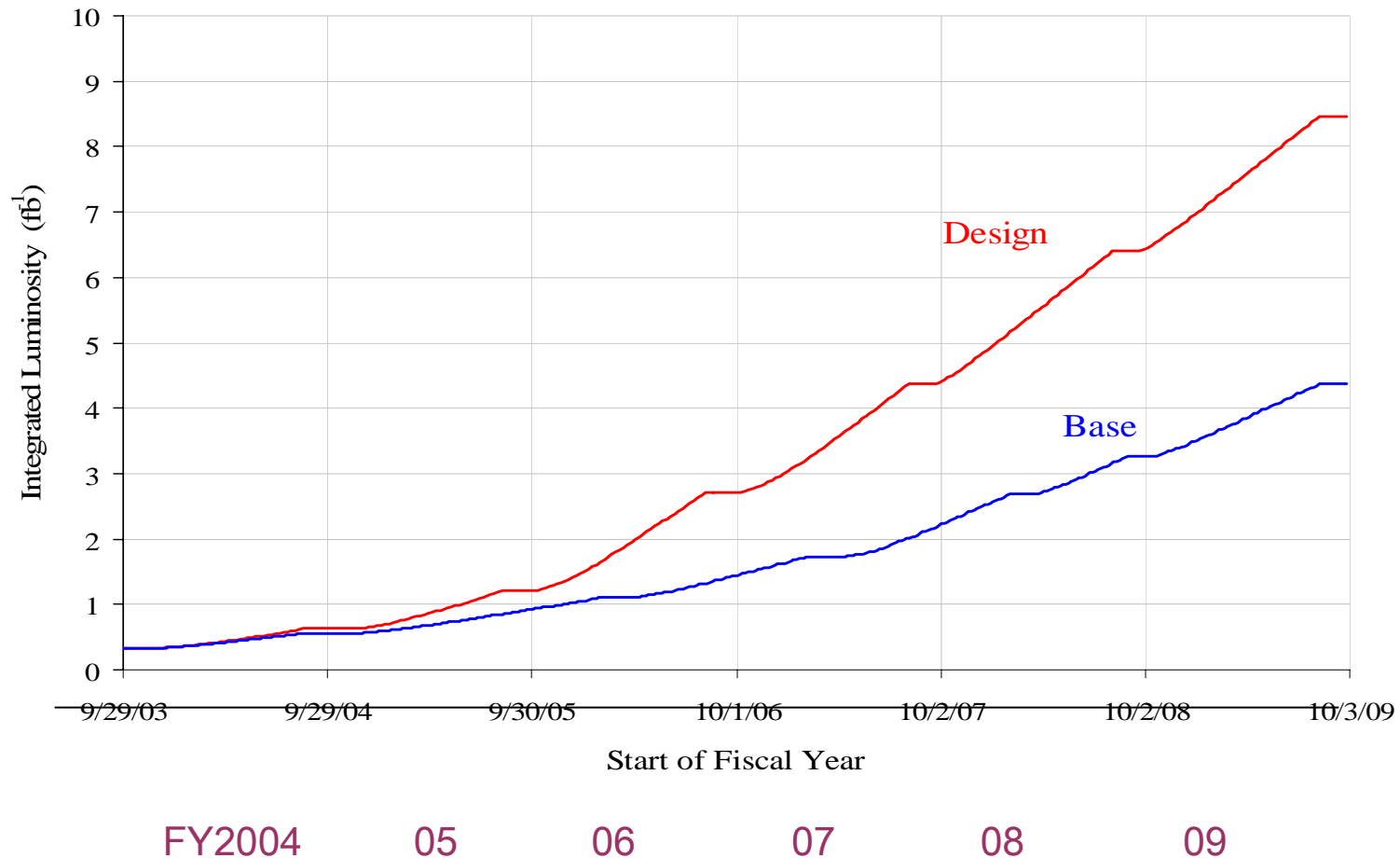
- **Experiments**

CDF and DZero – Upgrade installations

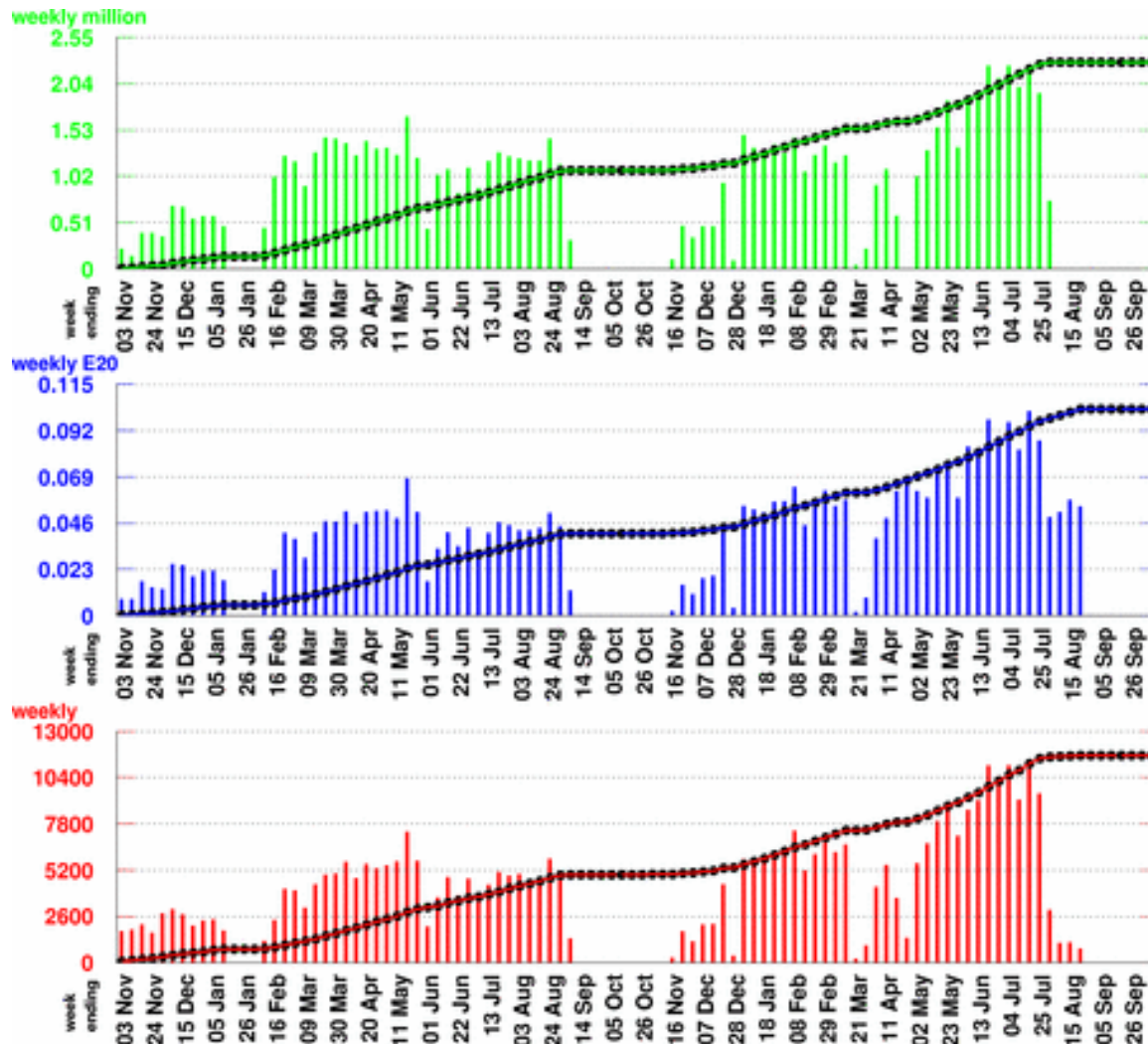
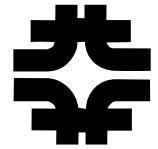
Projected Integrated Luminosity



Integrated luminosity will about double every year for next 4 years



MiniBooNE



Number of Horn Pulses

To date: 84.8 million
Largest week: 2.25 million
Latest week: 0 million

Number of Protons on Target

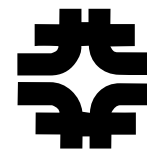
To date: 3.6611 E20
Largest week: 0.1016 E20
Latest week: 0 E20

Number of Neutrino Events

To date: 380781
Largest week: 11384
Latest week: 0

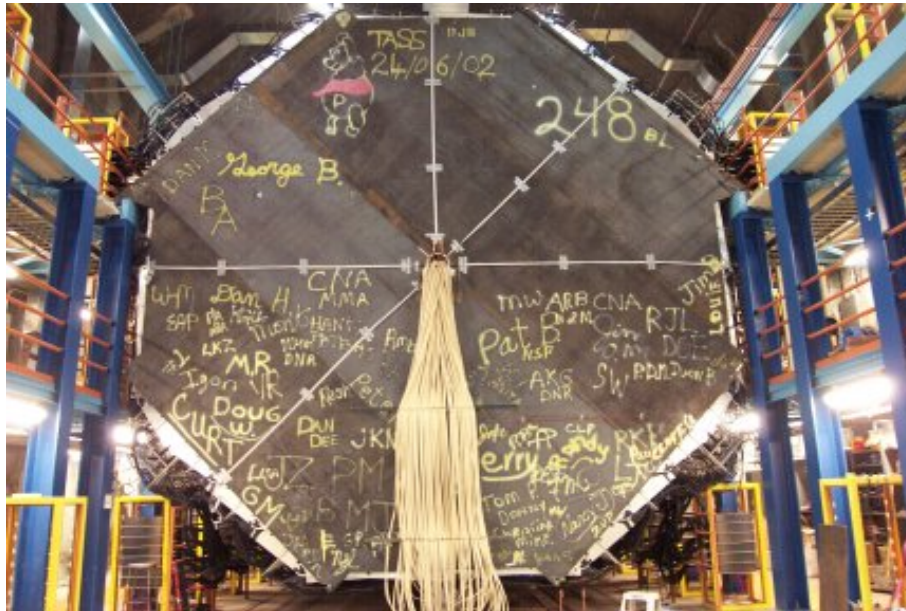
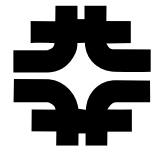
Prospects for the Booster Neutrino Beam

M. Witherell, August 6, 2004



- has made it possible to increase the intensity of the beam, which is running typically 8×10^{16} protons per hour on target with no antiproton stacking, 7×10^{16} per hour with full stacking. The number of protons delivered per week has been typically 9×10^{18} for a full operating week, a factor of two better than one year ago.
-
- In FY 2005 and beyond, assuming modest further improvement, we can expect that the Booster can deliver about 10×10^{16} protons per hour within the constraint of keeping activity down to acceptable levels in the Booster tunnel. We expect that antiproton stacking (with slip stacking) and NuMI operation will require initially just over 6×10^{16} protons per hour. Allowing for uncertainties in these numbers, we expect to be able to deliver $2\text{-}6 \times 10^{18}$ protons per week to the MiniBooNE target. For FY 2006 and beyond, when NuMI is running throughout the year, this works out to about $1\text{-}2 \times 10^{20}$ protons on target per year.
- Collaborations proposing experiments to run in the Booster neutrino beam in FY 2006 and beyond should plan their physics program on the basis of $1\text{-}2 \times 10^{20}$ protons on target per year.
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NuMI/MINOS Project

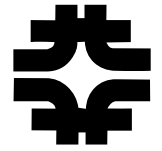


NuMI-MINOS

Sensitive in the “Atmospheric Region”
Long Baseline experiment with Near and Far Detectors
Uses 120 GeV Protons from Main Injector

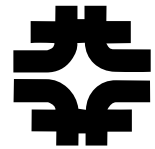


NuMI/MINOS Project



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- MINOS far detector installed and operating
 - Only large underground detector with magnetic field
 - Cosmic ray data taking
 - few dozen upward going atmospheric neutrino candidates
 - MINOS Near Detector
 - Detector modules are all installed
 - cosmic ray events use the actual MINOS DAQ system.
 - Magnet coil being installed now
 - Project Installation complete by end of shutdown
 - Commissioning and beam will follow

Schedule



2004-5 Fermilab Accelerator Experiments Schedule

This schedule will be updated regularly, as plans change.

Calendar Year		2004				2005			
Tevatron Collider									BT4V
		CDF & DZero	CDF & DZero			CDF & DZero			CDF & DZero
Neutrino Program	Q	MiniBooNE	MiniBooNE			MiniBooNE			OPH
	W		MINOS			MINOS			MINOS
Muon 120	HT	Test Beam	Test Beam			Test Beam			Test Beam
	HC		ESOTMPP			ESOTMPP			OPDH

Shutdown for MSD and CDF COT work, beginning March 15, 2004.

Summer 04 Shutdown is scheduled to begin on August 23, and is planned to last a nominal 13 weeks.

The length of the shutdown is driven by installation of electron cooling in the Recycler Ring.

The major 2005 shutdown is scheduled for the last 6 weeks of FY05.

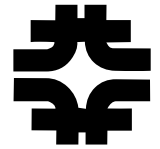
This draft schedule will be updated as more precise information is made available.

Additional shutdown periods will be added, typically allowing 50-60 weeks of scheduled accelerator operation per year.

	RUN or DATA
	STARTUP/COMMISSIONING
	INSTALLATION
	MSD (SHUTDOWN)

25 June, 2004

BTeV Strategy



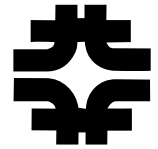
- PAC

- The Committee finds the studies presented to be sound. The Committee expects BTeV to be competitive with LHCb as soon as BTeV starts analyzing data, giving it a good chance to participate in the initial measurements, which should have significant discovery potential. The Committee reiterates that nothing in the staged schedule will affect the expected superiority of BTeV on a wide range of compelling heavy flavor physics topics. In light of these findings, the Committee unanimously endorses the staging plan for BTeV.

- P5

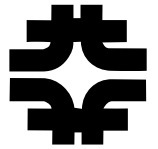
- On September 29, 2003 the High Energy Physics Advisory Panel (HEPAP) endorsed the Particle Physics Project Prioritization Panel (P5) Report recommending that BTeV move forward to a construction start, subject to overall budget constraints within the program, and with a goal that the construction be completed by the end of FY 2009.
- Given our analysis, we find that our conclusions of last year are unchanged in the staging scenario proposed by BTeV and we reaffirm these conclusions. The method of staging chosen by BTeV is an appropriate choice to maximize their physics opportunities.

***Off-Axis Detector to Study $\nu_\mu \rightarrow \nu_e$
Oscillations in the NuMI Beamline – NO ν A
(John Cooper / Gary Feldman)***



- The Committee strongly endorses the physics case for the NO ν A detector, and would like to see NO ν A proceed on a fast track that maximizes its physics impact. Both the physics case and the detector design have undergone rapid evolution since the PAC first received the NO ν A proposal. While the Committee applauds this progress, it concludes that Stage I approval at this time is premature. The collaboration should first complete the following steps:





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- The Committee first heard an informational presentation on the DES at its April 2004 meeting. Having found the science opportunities presented by this project to be “very exciting and important”, the team was encouraged to further develop its proposal in preparation for Stage I approval. In the interim,
 -
 - The PAC would like to see the issues raised by the preliminary review committee addressed by the DES team. In general, however, the Committee finds the science provided by the DES to be exciting and well worth the estimated costs of the project, assuming it can be carried out on the timescale of the new proposed schedule. **The Committee therefore encourages the Director to approve the submission of the letter proposal to NOAO and to grant Stage I approval for the beginning of work on the DES at Fermilab. Given the set of technical,**

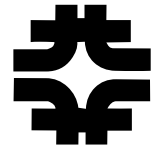
Long Range Planning Initiatives



- **LHC Physics Center**
 - **Intellectual focus for FNAL participation in LHC**
 - Virtual control room for CMS and Accelerator
 - Focal point for US physics effort on CMS
 - Builds on FNAL leadership of US CMS Detector Project
 - Builds on FNAL Leadership of US CMS Software & Computing Project
 - Builds on User Space and Virtual Control Room on WH11
 - Exploits synergy with strong Tevatron Collider participation
 - CDF/D0 Expertise already feeding into CMS analysis strategies
 - Theory Group with relevant interests and expertise (TeV4LHC Workshop)
- **Astroparticle Physics Center**
 - **Intellectual focus for the several healthy but small astroparticle efforts at FNAL**
 - Sloan Digital Sky Survey
 - Cryogenic Dark Matter Search
 - Auger South
 - SDSS Extension
 - Dark Energy Survey
 - JDEM/SNAP
 - Astroparticle Theory Group (DOE/NASA)

Long Range Planning

Linear Collider – Proton Driver



- Recommendation to develop two paths- LC and Neutrinos
- Linear Collider Technology Decision
 - FNAL will take leadership in SCRF in US
 - Existing warm RF effort terminated and effort redirected to SCRF
 - Increased Detector R&D effort, (Weerts coleading “Silicon Detector” concept study
 - Test Beam preparations
- Proton Driver
 - Development of Super Conducting LINAC option
 - Development of physics case
 - Lots of discussions around the world
- Superconducting RF Development
 - SMTF (Superconducting RF Module Test Facility)
 - Looking at integration into Meson Area infrastructure

Summary



- **FY2004 was a very good year**
 - **Colliders**
 - **Neutrinos**
 - **LHC preparations**
 - **LHC Physics Center**
- **Long Range Planning**
 - **LC Technology decision**
 - **Proton Driver Design**
 - **Physics Case (Workshop)**
 - **Strong Push on SCRF**
 - **SMTF (Superconducting RF Module Test Facility)**
- **Looking Forward to 2005 at the Tevatron**